REMARKS

I. Status of Claims

Claims 1-9 and 14-22 are pending. No claims are amended herein.

II. Rejections Under 35 U.S.C. § 103(a)

A. The Examiner rejects claims 1, 3-9, and 19 under 35 U.S.C. § 103(a) as being allegedly unpatentable over U.S. Patent No. 6,331,281 to Teru et al. ("Teru") in view of U.S. Patent No. 4,553,981 to Fuderer et al. ("Fuderer"). *See* Feb. 21, 2008, Office Action at 2-4.

The Examiner argues that Teru discloses certain subject matter, but concedes that it "does not specifically disclose purifying the separated hydrogen in a purifier." *Id.* at 2. The Examiner relies on Fuderer to attempt to cure this deficiency, noting that "Fuderer discloses purifying the separated hydrogen gas in a purifier." *Id.* (citing Fuderer, col. 1, lines 54-56). The Examiner concludes that it would have been obvious to modify "Teru's step of decomposing ammonia into hydrogen and nitrogen with Fuderer's purification of the hydrogen because the high levels of purified hydrogen optimizes the gas stream." *Id.* (citing Fuderer, col. 1, lines 64-68).

Applicants respectfully traverse the rejection for at least the following reasons.

Several basic factual inquires must be made in order to determine the obviousness or non-obviousness of claims of a patent application under 35 U.S.C. § 103. These factual inquiries, set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 17, 148 U.S.P.Q. 459, 467 (1966), require the Examiner to:

(1) Determine the scope and content of the prior art;

(2) Ascertain the differences between the prior art and the claims in issue;

(3) Resolve the level of ordinary skill in the pertinent art; and

(4) Evaluate evidence of secondary considerations.

The obviousness or nonobviousness of the claimed invention is then evaluated in view of the results of these inquiries. *Graham*, 383 U.S. at 17-18, 148 U.S.P.Q. at 467; *see also KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1730, 82 U.S.P.Q.2d 1385, 1388 (2007).

Indeed, to establish a *prima facie* case of obviousness, the Examiner must:

> make a determination whether the claimed invention "as a whole" would have been obvious at that time to that person. Knowledge of applicant's disclosure must be put aside in reaching this determination, yet kept in mind in order to determine the "differences," conduct the search and evaluate the "subject matter as a whole" of the invention. The tendency to resort to "hindsight" based upon applicant's disclosure is often difficult to avoid due to the very nature of the examination process. However, impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art.

M.P.E.P. § 2142. "The key to supporting any rejection under 35 U.S.C. § 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious." *Id.* It is important to note, moreover, that each prior art reference relied upon in a rejection "must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention." M.P.E.P. § 2141.03(VI) (emphasis in original); *see also Graham*, 383 U.S. at 17, 148 U.S.P.Q. at 467.

Here, the Examiner has not established a *prima facie* case of obviousness because the claimed invention as a **whole** would not have been obvious in view of Teru and Fuderer when considered as a **whole**. Specifically, nothing in Teru would have motivated one of ordinary skill in the art to separate and purify the hydrogen generated from the decomposition of ammonia and then use it in semiconductor processing.

Teru is directed to a process for cleaning ammonia-containing exhaust gas by bringing the exhaust gas into contact with an ammonia decomposition catalyst under heating to decompose most of the ammonia into nitrogen and hydrogen. *See* Teru, Abstract. It is clear from Teru that it is concerned solely with "minimiz[ing] ammonia effluence in the exhaust gas" (*id.* at col. 2, lines 23-29), rather than separating and purifying the hydrogen generated by the ammonia decomposition and then recycling the purified hydrogen for use in semiconductor processing. For example, the process disclosed in Teru allegedly makes it "possible to completely clean ammonia contained in the ammonia-containing exhaust gas without exhausting ammonia in the atmosphere at all." *Id.* at col. 8, lines 35-39. Examples 5 and 6 demonstrate that Teru is unconcerned about the hydrogen gas generated from the ammonia decomposition, and, in fact, the examples state the gas, which contains hydrogen, is exhausted to the atmosphere. *See id.* at col. 15, lines 13-16 and 55-57. Thus, Teru is entirely devoid of any teaching or suggestion of separating, purifying, and recycling the hydrogen used in semiconductor processing.

The Examiner's rationale for adding the hydrogen purification step disclosed in Fuderer is a classic example of obviousness based on impermissible hindsight, which *Graham* and the M.P.E.P. warn against, rather than the appropriate analysis under the *Graham* factors. *See Graham*, 383 U.S. at 36 (warning against a "temptation to read into the prior art the teachings of the invention in issue" and instructing courts to "'guard against slipping into the use of hindsight'"); *see also* M.P.E.P. § 2142, discussed *supra*. In the present case, one of ordinary skill in the art considering Teru would have had to first conclude that separating, purifying, and recycling the hydrogen formed during the ammonia decomposition process would have been desirable. As discussed above,

nothing in Teru evidences that this is the case. In fact, Teru teaches exhausting the gas containing hydrogen to the atmosphere. Accordingly, one of ordinary skill in the art would not have been motivated to add the purification and recycling of hydrogen disclosed in Fuderer to the process disclosed in Teru. The only rationale that the Examiner has for making this combination is based upon Applicants' claimed invention. Such a rationale is no substitution for a proper analysis under *Graham*, and, without more, Applicants respectfully submit that a *prima facie* case of obviousness has not been established. Thus, the rejection should be withdrawn.

Further, neither one of these references discloses or suggests a process, including, among other features, "using purified hydrogen gas in semiconductor processing," or an apparatus, including, among other features, "recycling purified hydrogen from the purifier to the semiconductor processing device." *See, e.g.*, Claims 1 and 19. For example, as discussed above, Teru is silent about separating, purifying, and recycling hydrogen for any purpose, and Fuderer is directed to treating gas streams from steam reforming, partial oxidation or coal gasification operations, rather than semiconductor processing. *See* Fuderer, Abstract. Moreover, none of the evidence of record supports the Examiner's allegation in the Office Action at pages 2-4 regarding the use of purified hydrogen gas in a semiconductor process. In particular, the Examiner fails to provide any support for the allegations regarding an alleged obvious design choice.

For at least this additional reason, Applicants respectfully submit that the rejection is improper and should be withdrawn.

B. The Examiner rejects claims 2, 14-18, and 20-22 under 35 U.S.C. § 103(a) as being allegedly unpatentable over Teru and Fuderer, as applied in the

rejection discussed above, and further in view of U.S. Patent No. 6,749,819 to Otsuka et al. ("Otsuka"). *See* Feb. 21, 2008, Office Action at 4-6.

The Examiner concedes that Teru and Fuderer do "not discloses a processing step of gallium nitride epitaxy," but relies on Otsuka to allegedly cure this deficiency. *See id.* at 4. Specifically, the Examiner asserts that "Otsuka discloses purification for a gallium nitride compound semiconductor," and that "[i]t would have been obvious to use Otsuka's purification with Teru/Fuderer's hydrogen because purified gases will provide a more effective device free from impurities." *Id.* at 4-5.

Applicants respectfully traverse the rejection for at least the following reasons.

As discussed above, the Examiner has not properly demonstrated that one of ordinary skill in the art would have had any reason to add the hydrogen purification and recycling steps disclosed in Fuderer to the semiconductor manufacturing process disclosed in Teru. Further, neither one of these references discloses or suggests using purified hydrogen gas in semiconductor processing. Otsuka fails to cure these deficiencies. In particular, Otsuka is directed to a completely different process than what is disclosed in Teru and Fuderer. Specifically, Otsuka discloses a process for purifying ammonia by contacting ammonia with a catalyst comprising manganese oxide and thereafter with a synthetic zeolite to remove oxygen, carbon dioxide, and moisture from ammonia that is recovered from a gallium nitride compound semiconductor process. *See* Otsuka, Abstract. The process disclosed in Otsuka, however, says nothing about using a catalyst to decompose the ammonia into nitrogen and hydrogen, let alone does it say anything about separating, purifying, and recycling hydrogen for gallium nitride processing. In fact, an object of the process disclosed in Otsuka is to "prevent[] hydrogen from being generated by the decomposition of ammonia even at a

relatively high contact temperature." *Id.* at col. 3, lines 9-16. In stark contract, Teru discloses a process to decompose ammonia into nitrogen and hydrogen. Accordingly, one of ordinary skill in the art would not have looked to Otsuka to separate, purify, and recycle hydrogen from ammonia-containing waste gas from a gallium nitride epitaxy step. *See* M.P.E.P. § 2141.03(VI) ("A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention.") (emphasis in original).

For at least these reasons, Applicants respectfully submit that a *prima facie* case of obviousness has not been established and request that the rejection be withdrawn.

Conclusion

In view of the foregoing remarks, Applicants respectfully request reconsideration of this application and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our Deposit Account No. 50-4244.

Respectfully submitted,

Date: August 19, 2008

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